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Original Article

Comparison of two different doses of lidocaine on the pain sensation during transrectal ultrasound-guided prostate biopsy

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ABSTRACT

Objective: To compare two different doses of lidocaine used for periprostatic nerve block on pain perception during transrectal ultrasound (TRUS) guided prostate biopsy.

Material and methods: A total of 288 patients with elevated prostate specific antigen (PSA) levels and/or abnormal digital rectal examination who underwent TRUS-guided prostate biopsy were included in the study. The patients were divided into 3 groups: Group 1 (n=103) prostate biopsy were performed after administering perianal intrarectal application of 10 mL 2% lidocaine gel, Group 2 (n=98) 2 mL of 2% lidocaine injection on each side following rectal installation of lidocaine gel and Group 3 (n=87) 4 mL of 2% lidocaine injection on each side after rectal instillation of lidocaine gel. Patients' pain scores during biopsy procedure were reported using visual analogue score (VAS). Independent sample t test, ANOVA test and Tukey test were used for statistical evaluation.

Results: The mean age, prostate volume and PSA level were 65.6±8.4 years, 58.2±34.8 mL, and 11.8±3.4 ng/mL respectively. There were no statistically significant differences in baseline characteristics between the groups. The mean VAS scores were 2.4±1.8 in Group 1, 2.5±1.9 in Group 2 and 1.6±1.6 in Group 3. Patients in Group 3, reported significant pain reduction compared with patients in Groups 1 and 2 (p=0.002, and 0.001, respectively). However, there was no statistically significant difference in VAS scores between Groups 1 and 2 (p=0.815).

Conclusion: According to our results we recommend the use of perianal intrarectal lidocain gel application, and periprostatic nerve block with injection of 4 ml 2% lidocaine per side combination in TRUS-guided prostate biopsies. Further large-scale randomized control studies are needed to validate these finding.

Keywords: Lidocaine dose; perianal intrarectal lidocaine; periprostatic nerve block; prostate biopsy; visual analog score.

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Introduction

Prostate cancer (PCa) is the most common cancer in elderly males, especially in developed countries.[1] With increased public awareness, the advent of prostate-specific antigen (PSA) screening and improvements in biopsy techniques, there has been a dramatic rise in the incidence of PCa. Transrectal ultrasound (TRUS) -guided prostate biopsy (PBx) is the standard procedure in the diagnosis of PCa with estimates as high as 800,000 biopsies being performed annually in the United States.[2]

During TRUS-guided PBx, 19 to 30% of the patients experience moderate to severe pain.[3,4] The pain, anxiety and discomfort of patient were observed to be increased with the shift from the sextant biopsy to 12- core or saturation biopsies.[5,6] Placement of the probe into the anal canal, movements of the probe inside and the passage of the needle through the prostate capsule are the main causes of pain.[7]

Currently, there is no accepted method of anesthesia for PBx. Among various methods of anesthesia, periprostatic nerve block (PPNB) with lidocaine injection appears to be the most popular method with or without intrarectal gel instillation.[8] In spite of the high preference of lidocaine in PPNB, the optimal dosage of lidocaine remains unclear.

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In this study we evaluated the efficacy and tolerability of PPNB with 2 or 4 mL of 2% lidocaine doses injected into prostatovesicular junction during TRUS-guided prostate biopsies and compared injectable lidocaine solutions with lidocaine gel and the control group, as well. Because it is not ethical to refrain from using analgesics, the group to which only lidocaine gel was applied was designated as the control group.

Material and methods

Two hundred and eighty-eight men who underwent TRUS-guided PBx from July 2008 to July 2010 were evaluated in this retrospective study. Institutional Ethics Committee approval of Gülhane Military Medical Academy Haydarpaşa Training and Research Hospital for the study was obtained and the written informed consent was acquired from each of the study subjects. Patients with elevated PSA (>3 ng/mL) level and abnormal digital rectal examination results like discrete nodules, focal induration or diffusely hard prostate were included in this study.

Patients with a history of TRUS-guided PBx, chronic pelvic pain, inflammatory bowel diseases, active urinary tract infections, anorectal problems like hemorrhoids, anal fissures, strictures and local anesthetic allergy were excluded from the study. The patients were divided into 3 groups without any criteria, apart from the date the biopsy was performed. PBx procedures were performed after administering perianal intrarectal application of 10 mL 2% lidocaine gel to patients in Group 1 (n=103). In Group 2 (n=98) 2 mL of 2% lidocaine was injected on each side following rectal instillation of lidocaine gel and in Group 3 (n=87). 4 mL of 2% lidocaine was injected on each side after rectal instillation of lidocaine gel.

All patients received standard antibiotic prophylaxis one day before and at least for four days after the procedure with oral ciprofloxacin given at doses of 500 mg twice a day. Bowel preparations were performed with Fleet® enema two hours before the biopsy.

Each patient was placed in the left lateral decubitus position and TRUS was performed using a 6.5-MHz transrectal probe. Then the prostate was evaluated in both sagittal and transverse planes to calculate the its volume. TRUS probe entry was made 5 minutes after application of the intrarectal lidocaine gel. PPNB was done with lidocaine injections applied near the junction of the seminal vesicle with the base of the prostate using a 22 gauge needle. An 18-gauge mounted on a 25-cm automatic biopsy gun was used to obtain a standard twelve core PBx 2 minutes after the peri-prostatic nerve blockade. No other methods of anesthesia (such as sedation or regional anesthesia) were used, except local anesthesia.

Patients' pain scores during the biopsy procedure were reported using visual analog score (VAS; validated for scoring the degree of pain in painful conditions as 0 for no pain, 10 for excruciating pain). VAS scoring was applied immediately after the biopsy procedure. Additionally, the relationship between the level of pain, prostate volume, age and PSA were evaluated. After the procedure, in order to prevent possible complications, all patients were monitored for at least one hour prior to their discharge from the hospital. Late complications related to the biopsy procedure were evaluated during the postoperative control appointment together with the results of PBx.

Statistical analysis

The groups were compared using Statistical Package for the Social Sciences®, (SPSS Inc. Chicago, IL, USA) version 16.0. The independent samples t test was used to compare the groups. We used ANOVA test for the comparison of three groups and Tukey test for post-hoc analyses. A *p* value of less than 0.05 was accepted as the threshold for statistical significance. The results were presented as mean ± standard deviation.

Results

The mean age, prostate volume and PSA level were 65.6±8.4 years, 58.2±34.8 mL, and 11.8±3.4 ng/mL, respectively. Statistically significant differences were not detected in baseline characteristics between the three groups (Table 1).

The mean VAS scores during prostate biopsy were 2.4±1.8, 2.5±1.9, and 1.6±1.6 in Groups 1, 2 and 3, respectively. Patients in Group 3, who had PPNB with an injection of 4 mL 2% lidocaine, reported significant pain reduction compared with patients in Group 1 who had been administered only perianal intrarectal 10 mL 2% lidocaine gel, and Group 2 who had PPNB with injection of 2 mL 2% lidocaine (p=0.002, and 0.001, respectively). However, there was no statistically significant difference in VAS scores between Groups 1 and 2 (p=0.815) (Table 2).

We found that pain scores were different between the three groups (p<0.001) however, post- hoc test demonstrated that only the Group 3 was different than the others (p<0.001) while the first and second groups were similar (p=0.560).

In multivariate linear regression analysis; none of the parameters including age, prostate volume and PSA, were independent variables affecting VAS scores (p=0.751, 0.933 and 0.336 respectively). In correlation analysis, statistically insignificant negative correlations were found between pain scores, and age (r=-0.026, p=0.348), PSA (r=-0.013, p=0.421) and prostate volume (r=-0.067, p=0.157).

Table 1. Patient characteristics

Groups*	n	Age	PSA	Prostate volume	VAS score
Group 1	103	67.2± 8.2	10.0±1.4	61.1±39.7	2.4±1.8
Group 2	98	65.0±8.7	14.9±3.6	59.2±40.5	2.5±1.9
Group 3	87	64.9±8.5	8.1±7.9	53.7±26.2	1.6±1.6
P [a,b]		0.620	0.600	0.727	0.001
Total	288	65.6±8.4	11.8±3.4	58.2±34.8	2.1±1.8

*Group 1: Perianal intrarectal 10 mL 2% lidocaine gel, Group 2: 2 mL of 2% lidocaine injection on each side, Group 3: 4 mL of 2% lidocaine injection on each side. [a]Kruskal Wallis Test, [b]Grouping variable: Anesthesia group; PSA: prostate-specific antigen; VAS: visual analogue scale

Table 2. Comparison of pain scores and patient characteristics between groups using independent samples t-test

Groups**	Age	PSA	Prostate volume	VAS score
1-2	0.064	0.212	0.735	0.815
1-3	0.063	0.297	0.139	0.002*
2-3	0.955	0.090	0.283	0.001*

*statistical significant, **Group 1: perianal intrarectal 10 mL 2% lidocaine gel, Group 2: 2 mL of 2% lidocaine injection on each side, Group 3: 4 mL of 2% lidocaine injection on each side: PSA: prostate- specific antigen; VAS: visual analogue scale

Discussion

Although TRUS-guided PBx is safe, men undergoing PBx experience considerable psychological stress related to the potential diagnosis of cancer, the anal route of penetration and the anticipated pain.[9-11] Zisman et al.[12] reported that 64% of the patients who underwent TRUS-guided PBx had anxiety about the pain before the procedure and 20% of the patients experienced severe pain during PBx or after. The pain, occured during PBx, is related with factors like introduction and movement of the TRUS probe in the rectum and the passage of the needle through the rectal wall and prostate capsule.[8]

Various types of anaesthesia were investigated for TRUS-guided PBx such as intrarectal lidocaine gel, periprostatic nerve blocks (PPNB), intraprostatic anaesthesia, pelvic plexus blocks, caudal blocks, pudendal nerve blocks, oral and intravenous drugs and sedoanalgesia.[8] After the first description of PPNB by Nash et al.[13] in 1996, numerous studies have been also reported about the effectiveness of PPNB.[14] Based on our clinical experience, biopsies were initially conducted as standard sextant biopsies with intrarectal lidocaine gel application or without anesthesia. Since the sextant biopsy was classified as an insufficient biopsy procedure in the literature, we started to obtain 12 core biopsies without changing the method of anesthesia we used. However we have realized that this anesthesia method was not satisfactory and added intrarectal gel application to the PPNB process. Initial applications of PPNB yielded unsatisfactory results in some patients, where 2 mL of 2% lidocaine were injected into both sides. So we began to inject 4 mL on both sides with a total of 8 mL, and compared these three techniques to find the best application among them.

This study does not answer to which anaesthesia method should be preferred for prostate biopsy. The preferred method may be determined in randomized controlled studies comparing different methods. However this study does suggest that instead of 2 mL, 4 mL lidocaine should be injected into both sides of prostate.

During PPNB, anaesthetic drugs are injected into different locations under TRUS guidance. The most common locations are the apex of the prostate, bilateral neurovascular bundle regions defined as basolateral nerve plexus, periprostatic nerve plexus or prostatovesicular junction, and lateral of the tip of seminal vesicles.[15-17] In our study, we injected anaesthetic drugs to the angle between the prostate and the seminal vesicles, that can be easily identified as an hypoechoic area on TRUS.

The most frequently used drug for PPNB is 1-2% lidocaine. But the optimal dosage, concentration and location on the prostate capsule remain unclear. There are several studies about the dosage of lidocaine. Schostak et al.[18] studied the difference in pain control between the injection of a total of 20 mL of 1% lidocaine into the apical and basal lesions and injection of a total of 10 mL of 1% lidocaine only into the basal lesions. The authors reported no significant difference between the groups regarding pain control. Kang et al.[19] studied efficacy of the periprostatic anesthesia according to the dosage of lidocaine between the two groups who had PPNB with an injection of 10 mL or 20 mL of 1% lidocaine into the prostatovesicular junction. They didn't find statistically significant difference between the VAS scores, and claimed that 10 mL of lidocaine was enough for providing effective pain relief for patients. Ozden et al.[20] reported that 10 cc 1% lidocaine injections provided significantly better pain control than lower doses for PPNB in their placebo controlled, prospective, randomized study. Lunacek et al.[21] assessed 123 patients in their prospective, randomized, double-blind clinical trials. They reported that the combination of perianal intrarectal lidocaine gel application and periprostatic 10 mL, 2% lidocaine infiltration is more effective for pain control than either lidocaine gel application or periprostatic lidocaine infiltration alone. In their study, the doses, and injection sites of lidocaine were different from those of the literature. They injected lidocaine

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in doses of 1-1.25 mL along the neurovascular bundle, starting from the base of the seminal vesicles and proceeding to the apex on both sides.

In our study we assessed the pain control with VAS scores between the injections of two different doses of 2% lidocaine into prostatovesicular junction iand compared them with the control group having only perianal intrarectal application of 10 mL 2% lidocaine gel. Patients in Group 3, who had PPNB with injections of 4 mL 2% lidocaine per side, reported significant pain reduction compared with patients in Group 1 who had only perianal intrarectal application of 10 mL 2% lidocaine gel and Group 2 who had PPNB with injection of 2 mL 2% lidocaine (p=0.002, 0.001). However, there was no statistically significant difference in VAS scores between Groups 1 and 2 (p=0.815) (Table 2).

In several studies it has been reported that there can be image artefacts on TRUS- guided biopsies related to the amount of anesthetic agent and the minute amounts of air along with the anesthetic agent.[22] Berger et al.[23] reported that the injection of 5 mL of anesthesia on each side of the gland did not cause technical difficulties in the visualization. Also in our study with two different doses of lidocaine, we did not have any imaging-related technical difficulties.

In conclusion, with our study it has been shown that PPNB with injection of 4 mL 2% lidocaine per side provides better pain control than perianal intrarectal application of 10 mL 2% lidocaine gel alone and PPNB with injection of 2 mL 2% lidocaine per side. Furthermore, injection of 2 mL 2% lidocaine per side does not achieve a statistically significant better pain control than perianal intrarectal application of 10 mL 2% lidocaine gel alone. We recommend combined use of perianal intrarectal lidocaine gel and PPNB with injection of 4 mL 2% lidocaine per side in TRUS-guided prostate biopsies. Further large-scale randomized prospective control studies are needed to validate these findings.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gülhane Askeri Tıp Akademisi Haydarpaşa Training Hospital (Date: 19.09.2013/ Number: 1491-88-13/1539).

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